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ABSTRACT

Twenty-four college students served as tutors in an examination of the use of paralanguage and nonverbal behavior in presenting a lesson intended for an adult of the tutor's age and for a child. Each subject was tape recorded twice while reading verbatim a lesson from a grade school textbook. Before each taping, the subject was told that the lesson would be played for either a college student or for a fourth grade student. In addition, a cardboard figure representing either a same-age or younger target was placed on a chair facing the subject. To obtain measures of paralanguage, 12 decoders rated the tone of voice used by each subject on the tape recordings. Measures of nonverbal behavior were provided by two trained observers. The results showed that the subjects used more variations in pitch, spoke more clearly, more slowly, and more softly when reading to the younger listener than to the same-age listener. The findings also showed that when reading to the younger listener, the subjects gazed more at the listener and engaged in more eyebrow activity than when reading to the same-age listener. In addition, both the paralanguage and nonverbal behavior used by the subjects were rated as being more friendly when addressing the younger listener than the same-age listener. (FI)

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Technical Report No. 491

DIFFERENTIAL USE OF PARALANGUAGE AND NONVERBAL BEHAVIOR BY TUTORS AS A FUNCTION OF RELATIVE AGE OF THE STUDENT

by

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Report from the Project on
Studies of Instructional Programming for the Individual Student

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Abstract

This experiment examined the use of paralanguage and nonverbal behavior while teaching a lesson intended for an adult of the same age as the teacher or for a child much younger than the teacher. Decoders rated the tone of voice used by each speaker from a tape-recording, to obtain measures of paralanguage. Trained observers provided measures of nonverbal behavior used by encoders. Results showed that subjects used more variations in pitch, spoke more clearly, more slowly, and more softly when reading to the younger-age than to the same-age listener. Findings showed that when reading to the younger-age listener the subjects gazed more at the listener and engaged in more eyebrow activity than when reading to the same-age listener. In addition, both the paralanguage and nonverbal behavior used by subjects were rated as being more friendly when addressing the younger-age listener than the same-age listener.

Differential Use of Paralanguage and Nonverbal Behavior by Tutors as a Function of Relative Age of the Student

Speakers commonly modify their speech according to a variety of norms when addressing listeners with different characteristics. One kind of modification can occur in the verbal content of speech. Social psychological research has demonstrated that the verbal content of forms of address varies according to the status of the addressee (Ervin-Tripp, 1969). Other research has shown that the bodily orientation of speakers can affect the content of speech (Moscovici & Plon, cited in Moscovici, 1967). One striking modification of speech occurs in the phenomenon of "baby talk." Snow and Ferguson (1977) and their colleagues have shown that in talking to infants, adults use simplified registers; the use of simplified verbal content in baby talk is a nearly universal phenomenon holding across cultures; the American Navaho Indian is the only known culture where baby talk does not occur (Ferguson, 1977).

Another kind of modification of speech can occur in the paralinguistic aspects of a spoken message. The present study focuses on the ways in which speakers modify paralanguage and nonverbal behavior in a teaching situation as a function of the age of the student. This issue is particularly germane to the topic of cross-age tutoring, which has been found to be an efficacious learning technique for both tutors (children who teach) and tutees (often younger children who are taught) (Gartner, Kohler, & Riessman, 1971). Allen (1976) has proposed that the processes that mediate beneficial

outcomes for both tutors and tutees seem to involve the nature of the communication that occurs between them. For example, it has been found that children are extremely sensitive to the socio-emotional aspects of a learning situation, and both learn and teach best under favorable affective conditions (Allen & Feldman, 1976). Positive affect can be communicated both by paralinguistic cues and by nonverbal behavior.

Previous research with children has examined the use of nonverbal behavior by tutors in response to the success or failure of a tutee (Feldman & Allen, Note 1). Ratings of the affective quality of tutors confronted with failure from their students were more negative than in the case of tutors confronted with successful students. Other research using children has examined the use of nonverbal cues by high and low achieving students to convey their level of comprehension of a lesson (Allen & Miller, Note 2). Yet another study examined the accuracy of perception between tutors and students based on nonverbal cues as a function of the degree of attention given to the nonverbal channel by the tutoring dyad (Allen & Plazewski, Note 3). In the latter study, tutees were found to be more accurate decoders of affective dimensions of nonverbal behavior than tutors, suggesting that students are particularly motivated to gather socio-emotional information from noncontent aspects of communication. This tendency may apply to paralanguage as well, and it points out the need to examine conditions that should theoretically enhance the positive socio-emotional aspects of both nonverbal behavior and paralanguage used by teachers.

There are theoretical reasons for expecting that cross-age tutoring dyads (i.e., situations in which the teacher is older than the student)

will lead to the use of more favorable paralinguistic and nonverbal cues than dyads composed of a teacher and student of the same age. The prediction that cross-age tutoring will enhance the favorableness of paralinguistic cues used by teachers (encoders) stems from the idea that baby talk phenomena may be generalized to other cross-age stimulus situations. Ferguson (1977) has suggested that baby talk serves the function of training infants in their native languages by simplifying the linguistic input they receive. One study (Garnica, 1977) showed that a group of mothers modified paralinguistic aspects of speech more strongly when talking to their infants (mean age 2;3) than did a group of mothers talking to their older children (mean age 5;4). Among the paralinguistic features that mothers used when addressing infants were higher pitch and longer duration of utterances. The Garnica (1977) study is suggestive, but falls short of a definitive test of the hypothesis advanced in the present study for three reasons. First, the mothers spoke to their own children and were not randomly assigned to the different-age conditions. Consequently, some other factor in the mother-child relationship that might be confounded with the relative age of the child could be the causal factor accounting for the observed paralinguistic differences. Second, the generality of mother-child interaction to the teaching situation is an open question. And, third, the study did not obtain any measure of the overall favorableness of the socio-emotional affect conveyed by the tones of voice shown to have different objective paralinguistic features. It is therefore possible that objective features differed as a function of relative age, but that no concomitant differential affect was conveyed.

Another series of studies (Shatz & Gelman, 1973) is in some respects more germane to cross-age tutoring in children, but similarly suffers from interpretive problems that stem from failing to create a true experimental design (by not employing random assignment), and from measuring only objective characteristics of vocal intonation and verbal content rather than socio-emotional judgments. The general conclusion of the study was that 4-year-old children adjust their speech (paralanguage and content) to different-aged listeners, and that greater adjustment occurs, the greater the difference in age.

The present study employs a true experimental design to examine differential use of paralanguage as a function of the relative age of the listener, and it employs measures of both objective vocal characteristics and socio-emotional affect conveyed by vocal intonations.

Theoretical reasons can be advanced for expecting that differential use of nonverbal behavior by encoders will also occur as a function of relative age of the student. Brideau (Note 4) has proposed that paralinguistic modifications of the voice are causally linked to nonverbal behaviors, that is, that attention to vocal intonations of emotional affect lead to nonverbal expressions of the emotion rather than the reverse. Consequently, it would be predicted that if cross-age teaching causes enhanced attention to creating positive paralinguistic affect, nonverbal behavior will follow suit and also be more favorable. The present experiment provides an indirect test of this hypothesis in the following sense: In our paradigm, encoders are told that a tape-recording of their voices will be used in a later

study on the efficacy of teaching aids for actual learners. In reality, they are tape-recorded while reading a lesson alone in a room. Consequently, encoders in this study were made aware of a real audience (either a same-age student or a younger-age student) for their vocal intonations, but did not expect their nonverbal behavior to be actually seen. This provides an indirect test for the hypothesis advanced by Brideau (Note 4). In any event, the present study provides the first test of whether encoders use more favorable nonverbal behavior when teaching a younger-age than a same-age student. This is an important question in its own right, because of the practical implications mentioned earlier for designing optimal tutoring situations.

Method

Design

The present study focused primarily on the paralanguage used by encoders while reading a standard mathematics lesson to students of differing age, with 12 decoders providing judgments on measures of paralinguistics. Three independent variables were manipulated: (a) relative age of the student (same-age as encoder/younger-age than encoder), (b) sex of encoder (male/female), and (c) sex of decoder (male/female).

In addition, the use of nonverbal behavior by encoders was examined as a function of the relative age of the student and the sex of the encoder. All dependent measures are described in detail below.

Encoders

A group of 12 male and 12 female undergraduates at the University of Wisconsin served as encoders in exchange for course credit. The vocal

intonations that were encoded by subjects while reading a standard lesson comprised the stimulus materials that were later judged by decoders.

Procedure

Each encoder was tape-recorded twice while reading aloud, verbatim, a lesson from a grade-school mathematics textbook. The lesson was 375 words in length, and described the characteristics of isosceles, equilateral, and right triangles. The reading by encoders was tape-recorded individually by the experimenter, who operated the recording equipment from an adjacent room.

The experimenter began each session with a cover story explaining that the encoder's task was to help prepare materials for use in a future study on tutoring. The encoder was informed that he or she would be tape-recorded while reading aloud a mathematics lesson, which ostensibly would later be played for students in order to "try to find out whether a vocal reading of a lesson helps, hinders, or has no effect on a student's learning of material from a textbook." Thus, encoders participated with the expectation that their voices would actually be used for teaching students. In order to prepare encoders for reading the lesson to students of two quite disparate ages, encoders were informed that "tutoring is used in grade-schools, high schools, and even at the college level." Each encoder was given an opportunity to become familiar with the lesson by reading it silently before being tape-recorded.

The experimenter described the ages of the students who were ostensibly later to learn the lesson. A student of college age and a student in the fourth grade were described just prior to the actual reading that was directed to each one. The order for reading the lesson to the same-age and younger-age student was determined at random for each encoder. When reading the les-

son aloud for the first time, encoders were not aware of the age characteristic of the second student they would teach, nor were they told in advance that the age of the second student would be different from the first. As a further precaution against bias, the experimenter left the room before each reading began.

The relative age of the student (simulated learner) was manipulated by spoken instructions, and by placing on a chair in front of the encoder either a large or a small white cardboard figure (consisting of head and shoulders). The large cardboard figure (86 x 68 cm) represented the same-age target, and the small cardboard figure (57 x 47 cm) represented the younger-age target. Before each of the two readings, the experimenter described the age of the target that the encoder should bear in mind as the recipient of the lesson. Thus, each encoder received both of the following instructions (order determined randomly), with appropriate substitutions depending on the same-age versus younger-age experimental treatment:

> OK, now I want you to read the lesson out loud, word for word, while I tape-record your voice. When you do this, I want you to read it in a way that is appropriate for tutoring someone who is unfamiliar with the material and is (an adult about your own age/a child in the fourth grade). Read only the words in front of you, but read them in a way that is appropriate for teaching (an adult of your own age/a fourth-grader). In order to help you do this realistically, I am placing a (large/small) cardboard figure in the chair in front of you to remind you throughout the lesson that you are teaching (an adult/a child in the fourth grade). I want you to teach the lesson just as you would

if a real student were sitting in front of you the whole time, because later a real student will attempt to learn the lesson. Read it in a manner that is appropriate for a student who is (an adult of about your age/a young child).

In all, two readings were tape-recorded from each encoder, with the experimenter giving standard descriptions of age of the student before each reading. During the readings, encoders sat at a table situated at a 45° angle to a small (28 x 28 cm) two-way mirror. From an adjacent room, the experimenter and another observer (who was blind to the experimental treatment) operated a tape-recorder and kept a record of the nonverbal behaviors of the encoder. When both readings were completed, encoders filled out a postexperimental questionnaire. The experimenter then thoroughly debriefed each encoder concerning those aspects of the cover story that were untrue and revealed the observations that were taken.

Dependent Measures

Two categories of dependent variables were examined in this study, along with additional information obtained from encoders on a postexperimental questionnaire. The principal set of dependent variables consisted of the decoders' judgments of vocal intonations used by the encoders. A second set of dependent variables consisted of observers' ratings of the nonverbal behavior used by the encoders. Additional self-report data were also obtained from encoders concerning their intentional use of paralanguage and nonverbal behavior.

Paralanguage. Eight measures of paralinguistic aspects of the encoders' speech were obtained. Data for seven of these measures came from de-

coders' judgments of the tape-recorded vocal intonations used by encoders. In the decoding procedure, 12 subjects responded in groups of 6 (3 males and 3 females). Decoders were informed by the experimenter that each encoder was a college student who had been asked to read a mathematics lesson aloud twice. Decoders were instructed to listen carefully to the tone of voice and manner of speaking used by each encoder, and to provide ratings of seven dimensions of paralanguage for each reading. Decoders were told not to look for systematic differences between first and second readings, because the order for presentation of readings was determined at random. The decoders were told to trust their first impressions or to use any other method for providing accurate assessments of the tone of voice in each reading. Decoders recorded their judgments on 9-point Likert scales while listening to each reading and during a pause after each reading. Decoders listened to all of the encoders. (Both the order for presenting male and female encoders and the order for reading to the same-age and younger-age student were randomized.) It required three 60-minute sessions for decoders to accomplish the listening in order to ensure that fatigue and boredom could not interfere with their ability to carefully judge the vocal intonations.

Decoders were 12 undergraduates (6 males and 6 females) at the University of Wisconsin. They volunteered to participate in exchange for $12.00 payment. Adults rather than children were employed as decoders on the assumption that adult interpreters are the most sensitive available instrument for detecting differences in paralinguistic affect. In addition, these raters could presumably provide more accurate data than children on the sev-

eral objective measures of vocal characteristics employed in this study.

Seven dependent measures were obtained from decoders' judgments on the following 9-point Likert scales: (a) voice quality (warm-cold), (b) pitch (high-low), (c) variations in pitch (none--a great deal), (d), speech clarity (imprecise-precise), (e) tempo (fast-slow), (f) volume (loud-soft), and (g) overall judgment of the friendliness and pleasantness of the encoder's tone of voice and manner of speaking (extremely unfriendly and unpleasant--extremely friendly and pleasant). The eighth variable, the objective duration of the encoder's reading of the lesson, was measured in seconds by the experimenter.

Nonverbal behavior. The experimenter and another trained observer watched the encoder through a two-way mirror. While the encoder read the standard lesson, an objective record of the use of three categories of nonverbal behavior and an overall impression of the positiveness of nonverbal behavior were ascertained independently by the two observers. The categories of nonverbal behavior observed in this study were chosen on the basis of pretest results. Categories were chosen that were unambiguous and occurred frequently during the pretest.

The following measures of nonverbal behavior used by encoders were obtained by the observers: (a) the frequency with which encoders looked up from their printed lesson (while reading) to directly gaze at the simulated student, (b) the frequency with which encoders engaged in movement of their eyebrows while reading, (c) the frequency with which encoders used their hands to make gestures, and (d) an overall rating of the degree of positiveness of the encoder's nonverbal behavior while reading (measured to .1 cm

by placing a mark on a 14-cm line which was labeled extremely unfriendly and unpleasant at the left [0 cm] end, and extremely friendly and pleasant at the right [14 cm] end of the line).

Data obtained by the two observers were averaged for each measure, since a preliminary data analysis showed high reliability between observers for all four measures. The correlation coefficients between observers were .99 for "looking up," .81 for "brow activity," .84 for "gestures," and .79 for "overall positiveness" (all N's = 48, all p's < .01).

Self-report data. After completing two readings of the mathematics lesson (i.e., for the younger-age student and for the same-age student), encoders filled out an eight-item postexperimental questionnaire concerning their intentional use of paralanguage and nonverbal behavior during each reading. The questionnaire consisted of four pairs of identically phrased questions. One question in each pair asked about the extent to which a given category of behavior was used when reading for the fourth-grader, and the other asked how much it was used when reading to the adult. Encoders responded to all questions on 15-point Likert scales. The pairs of items concerned: (a) how much the encoder "tried to show involvement and concern by leaning forward" (did not lean forward at all--leaned forward a great deal of the time), (b) how much the encoder "lifted eyes from the printed page to look at the (imaginary) student" (did not look at the student at all--looked at the student a great deal of the time), (c) how much the encoder "made hand gestures" (made no hand gestures--made hand gestures a great deal of the time), and (d) how much the encoder "purposely tried to make a friendly and pleasant tone of voice" (did not try to make pleasant and friendly

vocal intonations--tried very hard to make pleasant and friendly vocal intonations).

Method of Analysis

All the paralanguage data from decoders were subjected to a 2 x 2 x 2 mixed-design analysis of variance. The between-subjects factor was sex of decoder (male/female) and the within-subjects factors were sex of encoder (male/female) and relative age of the student (same-age/younger-age). Summaries of these analyses can be found in Appendices I-VII.

Other paralanguage data (the objective measurement of time spent reading) were subjected to a 2 x 2 mixed-design analysis of variance; sex of the encoder (male/female) was the between-subjects factor and relative age of the student (same-age/younger-age) was the within-subjects factor. A summary of this analysis can be found in Appendix VIII. All nonverbal behavior from the observers were analyzed by a 2 x 2 mixed-design analysis of variance in which the between-subjects factor was sex of encoder (male/female) and the within-subjects factor was the relative age of the student (same-age/younger-age). Summaries of these analyses can be found in Appendices IX-XII.

Self-report data from encoders were analyzed with paired observation *t* tests for each of the four pairs of items concerning identical behaviors.

Results

Results for the main effect of relative age of the student on 12 dependent variables are presented in Table 1. Results for each dependent variable are discussed in detail below.

Table 1

Encoders' Use of Paralanguage and Nonverbal Behavior as a Function of Relative Age of the Student

Category	Relative age of student		
	Younger-age	Same-age	F
Paralanguage			
Affective dimensions			
1. Overall friendliness	4.93	4.54	6.83**
2. Voice quality (warmth)	4.91	4.56	4.81*
Objective vocal characteristics			
3. Pitch	5.83	5.71	1.99
4. Variation in pitch	5.44	5.01	7.18**
5. Speech clarity	6.03	5.55	12.97***
6. Tempo (slowness)	5.52	4.14	265.30***
7. Volume (softness)	4.81	4.58	10.71***
8. Time (in seconds)	161.17	151.50	21.01***
Nonverbal behavior			
9. Gaze at student	19.35	13.06	7.32**
10. Brow activity	14.96	9.06	12.90***
11. Hand gestures	3.10	1.58	.85
12. Overall friendliness	8.91	6.46	10.52***

*$p < .10$.

**$p < .05$.

***$p < .01$.

Paralanguage

As shown in Table 1, the results for paralinguistics aspects of speech are presented in two groups. The first group pertains directly to the affective dimension of vocal intonations used by encoders, and includes two measures--overall friendliness and voice quality (warmth). The second group pertains to objective vocal characteristics of the intonations used by encoders. This group includes six measures: (a) pitch, (b) variation in pitch, (c) clarity, (d) tempo, (e) volume, and (f) time spent reading.

Affective dimensions. Data from decoders' judgments of the overall friendliness and pleasantness of the tone of voice used by encoders revealed a main effect of relative age of the student, $F(1,10) = 6.83$, $p < .05$. As predicted, encoders used more friendly and pleasant vocal intonations when reading to the younger-age student ($M = 4.93$) than to the same-age student ($M = 4.54$). No other main effects and no interactions were observed on the measure of overall friendliness and pleasantness of vocal intonations.

Data from the decoders' judgments of the quality of voice (warmth) used by encoders showed a marginally significant effect of relative age of the student, $F(1,10) = 4.81$, $p < .10$, and a significant main effect for sex of the encoder, $F(1,10) = 5.34$, $p < .05$. The main effect of age of the student showed that, as predicted, encoders conveyed greater warmth when reading to the younger-age student than the same-age student. Vocal intonations by encoders were judged as being more warm when reading to the younger-age student ($M = 4.91$) than to the same-age student ($M = 4.56$); however, this difference attained only marginal statistical significance.

The main effect of sex of encoder revealed that decoders judged the quality of female encoders' vocal intonations to be significantly more "warm" than the intonations of male encoders. The mean rating of warmth for female encoders was 4.92 as compared with 4.54 for male decoders. Perhaps in socialization females are trained to convey greater warmth in their tone of voice than males. No other main effects or interactions were observed on this measure of warmth.

Objective vocal characteristics. Data from decoders' judgments of the pitch used by encoders failed to show a significant main effect of relative age of the student, $F(1,10) = 1.99$, ns. However, this measure did show a significant main effect of sex of encoder, $F(1,10) = 11.40$, $p < .01$. Male encoders were rated as using vocal intonations with significantly lower pitch ($M = 6.20$) than females ($M = 5.35$), and this probably reflects natural differences in pitch between males and females. No other main effects and no interactions were observed on this measure of pitch.

Data from decoders' judgments of the variation in pitch used by encoders revealed a main effect of age of the student, $F(1,10) = 7.18$, $p < .05$. Encoders were perceived as using significantly more variations in pitch when reading to the younger-age student ($M = 5.44$) than to the same-age student ($M = 5.01$). No other main effects and no interactions were observed on the measure of variations in pitch.

Data from decoders' judgments of the clarity of speech used by encoders revealed a main effect for relative age of the student, $F(1,10) = 12.97$, $p < .01$, and a main effect for sex of encoder, $F(1,10) = 10.02$, $p < .05$. The main effect for relative age of the student showed that en-

coders spoke more clearly when reading to the younger-age student (M = 6.03) than to the same-age student (M = 5.55).

The main effect of sex of encoder revealed that decoders judged the speech of female encoders as having greater clarity than the speech of male encoders. The mean rating of speech clarity was 6.08 for female encoders as compared with 5.51 for male encoders. Perhaps in socialization females are trained to speak more clearly than males. No other main effect and no interactions were observed on the measure of speech clarity.

Data from decoders' judgments of the tempo of speech used by encoders revealed a main effect for relative age of the student, $F(1,10) = 265.30$, $p < .01$, and a main effect for sex of encoder, $F(1,10) = 77.26$, $p < .01$. The main effect of relative age of the student showed that encoders were judged to speak significantly slower when reading to the younger-age student (M = 5.52) than when reading to the same-age student (M = 4.14). Data reported below from an objective measurement of the duration of readings, show that decoders accurately perceived the differential tempo used by encoders when reading to students of different relative ages.

The main effect of sex of encoder revealed that decoders judged the tempo of speech to be significantly slower for female encoders (M = 5.13) than for male encoders (M = 4.54). Although data reported below, from an objective measurement of the duration of readings, failed to find a significant main effect of sex of encoder, the means were in the same direction as decoders' judgments and showed that, on the average, readings by female encoders lasted about 10 seconds longer than readings by male encoders. Perhaps the greater speech clarity and warmth of vocal intonations by females

combined with the objective (but nonsignificant) differences in duration, and created the impression of slower tempo for female encoders than for male encoders. No other main effect and no interactions were observed on this measure of decoders' ratings of speech tempo used by encoders.

Data from decoders' judgments of the volume of speech used by encoders showed a significant main effect of the age of the student, $F(1,10) = 10.71$, $p < .01$. Encoders spoke significantly more softly when reading to the younger-age student ($M = 4.81$) than to the same-age student ($M = 4.58$). No other main effects and no interactions were observed on this measure of how loud the encoders spoke.

Finally, data from an objective measurement of the time taken to read the lesson revealed a main effect of age of the student, $F(1,22) = 21.01$, $p < .01$. Encoders took longer to read the lesson to the younger child ($M = 161.17$ sec) than to the same-age student ($M = 151.50$ sec). This indicates that decoders' judgments of tempo of speech (as a function of relative age of the student) accurately reflected objective differences in speech tempo. No other main effects and no interactions were found on this objective measure of time taken to read the lesson.

Overall, these data indicate that the encoders created impressions of greater warmth and friendliness when reading to younger-age than to same-age students, by making more variations in pitch, speaking more clearly, speaking more softly, and speaking more slowly.

Nonverbal Behavior

Data from observers' ratings of the frequency with which encoders directed gazes at the simulated student showed a main effect of the age of the student, $F(1,22) = 7.32$, $p < .05$. Encoders looked up (toward the stu-

dent) significantly more often for the younger student (M = 19.35) than for the same-age student (M = 13.06). No other main effects and no interactions were observed for this measure.

Observers' ratings of the frequency with which encoders lifted their eyebrows also showed a main effect of the relative age of the student, $F(1, 22) = 12.90$, $p < .01$. Encoders lifted their eyebrows significantly more often while reading to the younger students (M = 14.96) than to the same-age students (M = 9.06). No other main effects and no interactions were observed on this measure.

No significant main effects and no interactions of the independent variables were obtained on observers' ratings of the frequency of encoders' use of hand gestures.

Finally, observers' ratings of the overall friendliness and pleasantness of the encoders' nonverbal behavior showed a significant main effect for the age of the student, $F(1,22) = 10.52$, $p < .01$. Encoders were rated more positively while reading to the younger student (M = 8.91) than to the same-age student (M = 6.46). No other main effects and no interactions were observed on this measure.

Self-report Data

One item on the encoders' postexperimental questionnaire asked, "When reading to the fourth-grader, how much did you try to show involvement and concern by leaning forward?" An identical item asked how much the encoder leaned forward while reading to the adult student. Encoders reported leaning forward more often when reading to the younger student (M = 5.96) than to the same-age student (M = 3.79), $t(23) = 6.84$, $p < .01$.

Two other items asked encoders how much they lifted their eyes from the printed page to look at the figure of the child and the adult. Encoders reported lifting their eyes more often when reading to the younger student (M = 6.29) than to the same-age student (M = 4.46), $t(23) = 5.03$, $p < .01$. This result agrees with the observers' ratings, which also indicated that encoders lifted their eyes more often while reading to the younger than to the same-age student.

Other items asked encoders how often they made hand gestures. Results showed a significant difference in the use of hand gestures when reading to the younger-age student (M = 1.68) as compared with the same-age student (M = 1.06), $t(23) = 2.10$, $p < .05$. These low means for self-reported use of gestures by encoders agree with the observers' ratings which indicated that very little gesturing took place in either condition.

Finally, two items asked encoders, "to what extent did you purposely try to make your tone of voice friendly and pleasant?". Encoders reported using more friendly and pleasant vocal intonation when reading to the younger-age student (M = 7.87) than to the same-age student (M = 5.00), $t(23) = 7.62$, $p < .01$. This result accurately reflects the decoders' judgments which indicated that more friendly vocal intonations were used when encoders read to the younger-age student than to the same-age student.

Overall, encoders' self-reported use of nonverbal behavior and paralanguage closely parallel results obtained from observers and decoders on similar categories of behavior. This suggests that paralanguage and nonverbal behavior are intentionally modulated by encoders when communicating to students of different relative age.

Discussion

The present study found that adult speakers deliberately use differential paralanguage and nonverbal behavior when teaching young children as compared with teaching adults of their own age. With respect to paralanguage, several objective features characterized the vocal intonations used by encoders when teaching the younger-age student. Under this condition, subjects used more variations in pitch, spoke more clearly, more slowly, and more softly than when teaching a same-age student. Similarly, when teaching the younger-age student, subjects gazed more often at the figure of the student, and engaged in more eyebrow activity than when teaching a same-age student. Most importantly, both the paralanguage and nonverbal behavior used by encoders were rated as being more friendly when they addressed the younger-age student than the same-age student.

Several aspects of these results deserve discussion. First, the data suggest that differential use of the several objective aspects of paralanguage and nonverbal behavior may have mediated the observed effect of relative-age of the student on the kind of socio-emotional (degree of friendliness) impression made by encoders in the respective channels. From the present data it cannot be determined which of the objective dimensions of paralanguage and nonverbal behavior may have caused the differential friendliness ratings.

The nature of the experimental paradigm provides data that shed light on the possible causal relation between paralanguage and nonverbal behavior. Brideau (Note 4) has proposed that in the social skills involved in

creating impressions, paralinguistic modulations are primary and nonverbal behaviors secondary. In Brideau's model, paralanguage is primary in the sense that modulations in that channel are presumed to cause modulations in the nonverbal channel rather than the reverse. The present study provides weak support for this hypothesis because encoders expected their voices--but not their facial expressions--to be presented to real students. Consequently, they believed that their nonverbal behavior would not be seen by anyone, and directed it only at an inanimate cardboard figure. Nevertheless, differential nonverbal behavior was employed, and resulted in more favorable impressions in the younger-age than the same-age condition. Unfortunately, the self-report data from encoders indicating intentional use of nonverbal behavior as well as paralanguage in teaching the younger-age student tend to weaken any direct causal interpretation of cross-channel linkage.

One may ask why paralanguage and nonverbal behavior differ when teaching children as opposed to adults. The most plausible explanation may rest with different well-learned social norms. It is probably a general characteristic of most speech communities to simplify speech when addressing children. This may be universally functional for transmitting language to infants (Ferguson, 1977; Sachs, 1977) and perhaps will be generalized to any teaching situation that involves children. Important questions remain about whether the norm is activated by children of all ages and abilities, or exclusively by a particular range of ages.

As a final point, there are practical implications of the present results. This is the first demonstration in a teaching paradigm that an age

differential between teacher and student elicits more favorable socio-emotional communication from the teacher than a lack of age difference. To the extent that this finding is replicated in future studies involving children teaching other children, it suggests that an optimal formula for tutoring programs would be cross-age rather than same-age, tutoring dyads. In other words, because the teachers' paralanguage and nonverbal behavior can be expected to be more favorable in cross-age dyads, it may be best to structure tutoring dyads with older children teaching younger children. Previous research has shown that children prefer to be taught under positive affective conditions (Allen, 1976) and that they respond to such conditions with enhanced motivation for learning.

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Appendix I

Analysis of Variance on Decoders' Judgments of Overall Friendliness of Vocal Intonations Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	2.416	1.22
Error	10	1.981	--
Sex of encoder (B)	1	5.070	4.33
A X B	1	.025	.02
Error	10	1.171	--
Relative age of student (C)	1	2.088	6.83*
A X C	1	.484	1.58
Error	10	.306	--
B X C	1	.230	1.57
A X B X C	1	.015	.10
Error	10	.147	--

* $p < .05$.

Appendix II

Analysis of Variance on Decoders' Judgments of Voice Quality (Warmth) Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	.334	.22
Error	10	1.537	--
Sex of encoder (B)	1	1.750	5.34*
A X B	1	.280	.85
Error	10	.328	--
Relative age of student (C)	1	1.446	4.81**
A X C	1	.005	.02
Error	10	.301	--
B X C	1	.148	1.90
A X B X C	1	.070	.90
Error	10	.078	--

*$p < .05$.

**$p < .10$.

Appendix III

Analysis of Variance on Decoders' Judgments of Pitch Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	.385	.39
Error	10	.994	--
Sex of encoder (B)	1	8.641	11.40*
A X B	1	1.764	2.33
Error	10	.758	--
Relative age of student (C)	1	.172	1.99
A X C	1	.035	.41
Error	10	.086	--
B X C	1	.039	.40
A X B X C	1	.005	.05
Error	10	.098	--

*$p < .01$.

Appendix IV

Analysis of Variance on Decoders' Judgments of

Variations in Pitch Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	.418	.07
Error	10	5.994	--
Sex of encoder (B)	1	.840	1.21
A X B	1	.005	.01
Error	10	.694	--
Relative age of student (C)	1	2.213	7.18*
A X C	1	.016	.05
Error	10	.308	--
B X C	1	.148	1.24
A X B X C	1	.069	.58
Error	10	.120	--

*$p < .05$.

Appendix V

Analysis of Variance on Decoders' Judgments of Speech Clarity Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	.113	.09
Error	10	1.202	--
Sex of encoder (B)	1	3.889	10.02*
A X B	1	.009	.02
Error	10	.388	--
Relative age of student (C)	1	2.754	12.97**
A X C	1	.028	.13
Error	10	.212	--
B X C	1	.167	.73
A X B X C	1	.167	.73
Error	10	.229	--

*$p < .05$.

**$p < .01$.

Appendix VI

Analysis of Variance on Decoders' Judgments of Tempo Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	5.501	3.44
Error	10	1.597	--
Sex of encoder (B)	1	4.131	77.26*
A X B	1	.064	1.19
Error	10	.053	--
Relative age of student (C)	1	22.799	265.30*
A X C	1	.077	.89
Error	10	.086	--
B X C	1	.004	.05
A X B X C	1	.042	.58
Error	10	.073	--

*$p < .01$.

Appendix VII

Analysis of Variance on Decoders' Judgments of Volume (Softness of Voice) Used by Encoders

Source	df	MS	F
Sex of decoder (A)	1	2.442	3.54
Error	10	.691	--
Sex of encoder (B)	1	.507	4.27
A X B	1	.017	.14
Error	10	.119	--
Relative age of student (C)	1	.604	10.71*
A X C	1	.000	.01
Error	10	.056	--
B X C	1	.085	3.08
A X B X C	1	.014	.51
Error	10	.028	--

*$p < .01$.

Appendix VIII

Analysis of Variance on Time (in Seconds)

Spent Reading by Encoders

Source	df	MS	F
Sex of encoder (A)	1	1291.703	2.35
Error	22	549.278	--
Relative age of student (B)	1	2685.047	21.01*
A X B	1	93.500	.73
Error	22	127.816	--

*$p < .01$.

Appendix IX

Analysis of Variance on Observers' Records of Gazes Directed at Student by Encoders

Source	df	MS	F
Sex of encoder (A)	1	54.187	.09
Error	22	577.170	--
Relative age of student (B)	1	475.021	7.32*
A X B	1	60.750	.94
Error	22	64.874	--

*$p < .05$.

Appendix X

Analysis of Variance on Observers' Records of

Brow Activity Used by Encoders

Source	df	MS	F
Sex of encoder (A)	1	24.797	.16
Error	22	155.390	--
Relative age of student (B)	1	417.130	12.90*
A X B	1	51.047	1.58
Error	22	32.327	--

*$p < .01$.

Appendix XI

Analysis of Variance on Observers' Records of Gestures Used by Encoders

Source	df	MS	F
Sex of encoder (A)	1	22.005	.39
Error	22	56.566	--
Relative age of student (B)	1	27.755	.85
A X B	1	.255	.01
Error	22	32.482	--

Appendix XII

Analysis of Variance on Observers' Ratings of the Overall Friendliness of Nonverbal Behavior Used by Encoders

Source	df	MS	F
Sex of encoder (A)	1	67.925	2.40
Error	22	28.315	--
Relative age of student (B)	1	71.785	10.52*
A X B	1	9.810	1.44
Error	22	6.823	--

*$p < .01$.